Name: ______________________________ Date: _______________

Polynomial Operations SOLUTION (version 216)

1. Let polynomials $p(x)$ and $q(x)$ be defined below.

$$p(x) = -4x^5 + 2x^4 - x^3 - 9x^2 + 5$$
$$q(x) = -9x^5 - 6x^4 + x^3 + 8x - 4$$

Express the difference $q(x) - p(x)$ in standard form.

Get "unsimplified" forms. Then find $q(x) - p(x)$ with addition/subtraction.

$$\begin{aligned} p(x) &= (-4)x^5 + (2)x^4 + (-1)x^3 + (-9)x^2 + (0)x^1 + (5)x^0 \\ q(x) &= (-9)x^5 + (-6)x^4 + (1)x^3 + (0)x^2 + (8)x^1 + (-4)x^0 \\ q(x) - p(x) &= (-5)x^5 + (-8)x^4 + (2)x^3 + (9)x^2 + (8)x^1 + (-9)x^0 \\ q(x) - p(x) &= -5x^5 - 8x^4 + 2x^3 + 9x^2 + 8x - 9 \end{aligned}$$

2. Let polynomials $a(x)$ and $b(x)$ be defined below.

$$a(x) = 5x^2 - 7x + 6$$
$$b(x) = 5x + 8$$

Express the product $a(x) \cdot b(x)$ in standard form.

You can use a table for multiplication.

*	$5x^2$	$-7x$	6
$5x$	$25x^3$	$-35x^2$	$30x$
8	$40x^2$	$-56x$	48

$$a(x) \cdot b(x) = 25x^3 - 35x^2 + 40x^2 + 30x - 56x + 48$$

Combine like terms.

$$a(x) \cdot b(x) = 25x^3 + 5x^2 - 26x + 48$$

3. Express $(x+1)^6$ in standard (expanded) form.

Remember the binomial theorem. It tells us to use Pascal's triangle.

$$x^6 + 6x^5 + 15x^4 + 20x^3 + 15x^2 + 6x + 1$$

Polynomial Operations SOLUTION (version 216)

4. Let polynomials $f(x)$ and $g(x)$ be defined below.

$$\begin{aligned} f(x) &= -3x^3 - 18x^2 + x - 4 \\ g(x) &= x + 6 \end{aligned}$$

The quotient of $\frac{f(x)}{g(x)}$ can be expressed as a polynomial, $h(x)$, and a remainder, R (a real number).

$$\frac{f(x)}{g(x)} = h(x) + \frac{R}{x+6}$$

By using synthetic division or long division, express $h(x)$ in standard form, and find the remainder R.

I prefer using synthetic division.

$$\begin{array}{r|rrrr} & -3 & -18 & 1 & -4 \\ -6 & & 18 & 0 & -6 \\ \hline & -3 & 0 & 1 & -10 \end{array}$$

So,

$$\frac{f(x)}{g(x)} = -3x^2 + 1 + \frac{-10}{x+6}$$

In other words, $h(x) = -3x^2 + 1$ and the remainder is $R = -10$.

5. Let polynomial $f(x)$ still be defined as $f(x) = -3x^3 - 18x^2 + x - 4$. Evaluate $f(-6)$.

You could do this the hard way.

$$\begin{aligned} f(-6) &= (-3)\cdot(-6)^3 \ + \ (-18)\cdot(-6)^2 \ + \ (1)\cdot(-6) \ + \ (-4) \\ &= (-3)\cdot(-216) \ + \ (-18)\cdot(36) \ + \ (1)\cdot(-6) \ + \ (-4) \\ &= (648) \ + \ (-648) \ + \ (-6) \ + \ (-4) \\ &= -10 \end{aligned}$$

Or, if you reference the polynomial remainder theorem, you can state that you know $f(-6)$ equals the remainder when $f(x)$ is divided by $x+6$. Thus, $f(-6) = -10$.